

## Organic Minerals Compared to Inorganic Minerals

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### Minerals: Organic versus Inorganic

Minerals are inorganic molecules also called elements and are derived from the earth. Inorganic minerals can be incorporated into living tissue (organic) but eventually return to the earth in the inorganic form when excreted by the animal, or as ash once the animal is buried or cremated. Basically, minerals are chemical molecules that are utilized in a variety of ways but cannot be reduced to simpler substances.

Minerals are essential to the physical and mental well being of horses. They are components of all cells, including blood cells, nerve, muscle, bone, teeth, hormones and soft tissue. Many other minerals are an integral part of enzymes that catalyze biochemical reactions such as energy production, metabolism, nerve transmission, muscle contraction, and cell permeability.

### Mineral availability varies according to source

Minerals can vary in how absorbable and utilizable they are in the horse. The bio-availability of a mineral or its relative availability to the animal is determined by its interaction with other minerals or dietary components as mentioned previously. The more bio-available a mineral becomes, the lower the dietary concentration needs to be to obtain to meet the daily requirement in the horse. Additionally, the more highly absorbable the mineral, less mineral is excreted to the environment, which is becoming an increasingly important issue. As new restrictions are imposed on the inclusion of dietary trace minerals in animal feeds, feed manufacturers are seeking alternatives that are economical, yet maintain performance and reduce nutrient excretion.

Mineral interactions may be positive (synergistic), where one mineral enhances the bioavailability of another, or negative (antagonistic), in which case one

mineral decreases the bioavailability of another. An example of positive interaction is that of copper and iron, where copper is essential for iron absorption and metabolism. Copper deficiency impairs iron metabolism. An example of negative interaction is zinc-copper antagonism, in which excess zinc has a severely detrimental effect on the bioavailability of copper. Multiple interactions can occur such as excess zinc inducing copper deficiency, which, in turn, has an adverse effect on iron metabolism. Therefore, close attention must be paid to not only the amount of mineral fed, but also the ratio of each mineral to the others in the total ration.

### **Chelated or “organic” minerals**

Inorganic minerals have traditionally been used in horse feeds and are listed as oxides or sulfates on feed tags. Recently, technology that combines the inorganic mineral with an organic molecule, has become an alternative to using inorganic minerals in feeds. Organic minerals are also called “chelates” or “proteinates”. Chelation involves the attachment of the mineral to an amino acid or other organic component so that the two do not disassociate in the digestive system, essentially protecting the mineral so it can be absorbed across luminal wall intact. For some minerals, a chelated compound is better than some other forms, but others absorption is not improved with complexing. For those that are better fed as a chelate, absorption is more efficient due to a neutral electrical charge. Non-chelated inorganic minerals have either a positive or negative charge. Both calcium and magnesium are examples where “chelated forms” are not any better absorbed than inorganic forms such as calcium carbonate and magnesium oxide. Both are easily separated and the calcium and magnesium ions are well absorbed.

Because digestibility of oxides is very low, they are inexpensive to feed. Sulfates are slightly higher in digestibility but cost more to incorporate into a ration. Organic minerals, however require more processing than oxides and sulfates, and are therefore the most expensive to use. There are many different forms of organic minerals and bio-availability varies depending on what type of molecule they are attached to (see side bar). Most commonly, zinc, copper and selenium have higher absorption as “proteinates”. Feed companies often use a combination of mineral sources, but for the most benefit organic minerals should comprise at least 25% of the total mineral supplementation.